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EGG-TOOTH OF SNAKES AND LIZARDS,

WITH A PLATE.

ON THE

ARMATURE OF THE LOWER BILL OF THE HATCHING TRINGA PUSILLA....... *Wilson.*

BY

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THE EGG-TOOTH OF THE YOUNG SNAKES AND LIZARDS.

BY DR. D. F. WEINLAND.

(*With a plate.*)

In the year 1853, I had an opportunity of studying the embryology of the European Ring Snake, (*Tropidonotus natrix*, Kuhl.) having found, in the beginning of August, some four or five dozen of her eggs. I watched the development of the embryos, opening the eggs from day to day. On the 26th of Aug. while looking over the eggs, I was surprised to find, in many of them, a long sharp slit through their thick leathery shell, not at all torn by the pressing of the embryo from within, as one would suppose, but, as I saw clearly enough, cut as if by a sharp knife. I took out the embryo and sought for a tubercle on the top of the snout, remembering the horny wart of the young chicken for the same purpose; but there was nothing to be found. While I was holding the little snake in my hand, it scratched my finger, and thus disclosed its cutting instrument —a single, very sharp and rather broad tooth, protruding a little way, nearly horizontally from the upper jaw (Fig. 1. b.) This tooth was about one millimeter (about 4-100 of an inch) long, and half as broad, fixed in a socket in the middle of the intermaxillary bone, which bears no other tooth. This two edged shovel-like knife projected a quarter, sometimes a half of a millimeter from the upper jaw, as the diamond of the glazier does from its handle. To a shovel it bears the additional resemblance of being concave above, convex below. The lower convex part is swelled up about the middle, resembling a bowl, which makes the odd profile view of the tooth (Fig. 5.) The two lower corners of it are generally rounded. Below and on the sides, the margin is sharp, cutting and transparent, while the thicker centre, containing the pulp of the tooth, is yellowish and dark. I have made a microscopical preparation of the egg tooth of our common Black Snake, (*Coluber constrictor*, Linn.,) from an alcoholic specimen, procured for me by my friend, Mr. F. W. Putnam, of Salem. This preparation is drawn in the plate.

This egg-tooth represents in its structure all the characteristics of the teeth of snakes and lizards generally; and being at the same time small enough to allow a high power of the microscope, it is the best object I know, for studying that kind of teeth.

The central cavity is bottle-shaped, and is entirely filled with the yellowish pulp, in which were seen the contours of large balls. Upon and around this central pulp rests the hard tooth, flattened out about the margin, consisting of Dentine (*Substantia eburnea*) penetrated by its canals (*Canaliculi dentium.*) These canals, raying out from the cavity of the pulp towards the margin like a fan, open into that cavity, and contain, when fresh, a yellowish fluid, but soon they become white by drying and successive reception of air. They run out first in large, simple canals, often a little undulated; but soon they branch, and the branches anastomosing with each other, form a network of very fine capillaries. As this network does not reach the periphery of the tooth, there remains a broad margin entirely solid and transparent, like glass. This is the sharp cutting edge. From the analogy with other teeth, and from a view with a lower power of the microscope, one would suppose that this transparent margin was an enamel crown extending all over the tooth, but even with a very high power, I could not find any trace of the characteristic polygonal fibres, and we can state that this margin of the tooth is also composed of one and the same homogeneous dentine, as the rest.

There was no trace visible of either a blood-vessel or nerve reaching into this pulp. With man and mammalia, this is characteristic of a very old tooth; but with this egg-tooth, which is on the contrary very young, the drying of the nutritive organs indicates nothing but their short duration. After the drying and dying of those organs, and the consequent drying of the pulp and the fluid in the canals of the Dentine, the tooth is only held mechanically in its socket, and being not very deeply set, is rubbed off by the first violent contact. This process, of a sudden drying of life-imparting organs, is very like that by which the horns of the deer are cast off yearly.

The short duration of this tooth, for it drops in one or two days after the hatching of the snake, accounts for its having been overlooked by naturalists for so long a time. Even Rathke, in his beautiful work on the evolution of the Ring Snake, published in 1839, has made no mention of it, though he describes very minutely the intermaxillary bone of the nearly developed embryo. Nevertheless it was not new. Already in the year 1841, J. Muller, as I heard afterwards from himself, had discovered it in alcoholic specimens of the fully developed embryos of snakes and lizards,* and I am glad of confirming upon the living animal, and by microscopic investigation, the discovery of my highly esteemed teacher and friend.

I found afterwards the same tooth, (which we may call egg-tooth from its only function) in the embryos of all German Snakes and Lizards, in the viviparous *Vipera berus*, *Coronella austriaca*, *Lacerta crocea*, and *Anguis fragilis*, as well as in the oviparous Lizards, *Lacerta agilis* and *viridis*, and also in the American *Ameiva vulgaris*, *Crotalus Catesbaei*, and *Epicrates cenchris ;* of which the two latter are also viviparous, and do not have the thick leathery shell which is found in all oviparous Snakes and Lizards. In the Crocodile, of which I investigated fine specimens, just hatching, in the Zoological Museum in Berlin, I could not find any trace of this tooth. This fact, stated already by J. Muller, shows again, with many others, that Crocodiles must be separated as a distinct order of reptiles from the genuine Lizards, and that the latter are nearer to the Snakes than to the Crocodiles. The eggshell of a Crocodile is like that of a Bird or Turtle, hard and very rich in lime, thus easier to be broken by the hard snout of the young, as with Birds and Turtles, by the horny wart on their bills; while the eggshell of the genuine Snakes and Lizards, which I afterwards investigated, is composed of several layers of very fine but strong fibres, felted together in a leathery elastic membrane (Fig. 6.) The time and manner of the formation of these fibres is not clear; some observations, however, made in the same summer, upon fresh eggs, seemed to me to show that they originate from cells. I saw in the felt, here and there, yellowish, oval bodies, generally provided with a small nucleus. I succeeded in separating some, and saw these yellowish bodies, clearly continued on one side into very long fibres. Thus these bodies seem to be the cells from which the fibres grow. Now these cells at the ends of the fibres were of different size, some being four times as large as the diameter of their fibres, and others not much thicker than the fibre itself. I suppose that this latter state was the end of the evolution of the cell, and so we understand why, at a later time, when the eggshell is fully grown, we no longer find these cells. (Some of these fibre cells or bulbs are shown in fig. 7.)

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* See J. Muller, Archiv fur Anatomie und Physiologie.

I add to this description, some physiological remarks, in reference to the egg-tooth, in comparison with other organs of living organisms.

We often see in physiological papers the various organs and systems of organs, of the animal and vegetable body, treated in reference to the importance they bear to the whole economy of the living being. Every physician knows that there are many organs, most of them exterior ones, for instance organs of touch or locomotion, as fingers, hands, arms and legs, or even organs of the higher senses, as the tongue, nose and eye, which may be hurt or totally destroyed, without destroying necessarily the life, or even the health of the remaining organism. We know from experiments made in physiological laboratories, upon mammals or other vertebrates, that even some interior organs, as for instance, certain parts of the brain, the whole spleen, &c., may often be taken out without interfering with the health of the animal; while on the contrary there are other organs, as the medulla oblongata, the heart and the intestines, which are so important for sustaining life, that frequently a slight wounding of them is followed by death. This is one way of viewing organs, and certainly a very practical one. But there is another, if not so practical, certainly as philosophical, namely to compare the organs with one another, with reference to the history of the life of the individual, when they make their first appearance, when they begin to work, when they stop working, and when they fade away. We will allude here only to some instances. Let us consider any of the Vertebrates, after the fecundation of the egg, by the penetrating of the Zoospermia into it, and after the segmentation of the yolk is over. We see, as the first signs of the new being, a furrow more open on one side than on the other. This furrow is the birthplace of the future brain and dorsal marrow, the more open part at the anterior end being the future brain.

The sidewalls of this furrow begin to grow upwards and meet above, thus making a tube of the furrow; and it is very remarkable, that this closing takes place first in the very place, where the medulla oblongata is afterwards formed, this most delicate and most important part of the organism. Soon after this furrow is closed, we see a longitudinal, tube-like heart beating; and an intestine formed. We will not go into further details. We already see that just those organs, which are the principal supporters of the animal and vegetable life of the vertebrates, and which therefore remain through its life, are also those, which first make their appearance in the development of the embryo. Now on the contrary other organs, for instance the senses, appear much later in the embryo, and generally fade away in the decrepitude of age, often long before death. Still shorter, and confined only to the best part of life, at least with mankind, is the activity of the reproductive organs, but the organs of far the shortest duration are found with Vertebrates in the embryonic period. The placenta of the young Mammalia, and the yolk placenta of the Sharks, are confined to the short period of the gestation of the young in the womb of the mother. The allantois of the Mammalia, Birds and Reptiles proper, the organ of respiration of the embryo as long as it is enclosed in the membranes of the egg, disappears as soon as the embryo is hatched. The interior gills of the tadpol es of our frogs, and their only locomotive organ, their strong tail, last only through their fishlike period of life in water, some weeks or months; the exterior gills of the same only for some days. Thus we may have a series of the duration of the organs of one individual. But there is hardly in any Vertebrate, another organ, which is so transient as the tooth of the hatching lizards and snakes, previously described. Its only function is to cut open the eggshell, which it may perform in the time of a second, and soon after it drops.

EXPLANATION OF THE PLATE.

FIG. 1 Head of the hatching Black Snake, (*Coluber constrictor*, Linn.) a. Snout, or rostral plate.
b. Egg-tooth. c. Slit of the windpipe. d. Tongue.

FIG. 2. The Egg-tooth with a part of the intermaxillary bone. (Natural size.)

FIG. 3. The same seen from above. (Magnified 125 times.)
b. The tooth. c. Intermaxillary bone, showing the little bone cavities, or bone cells.
d. The contour of the intermaxillary bone, appearing through from the lower side. e. Nutritive canals of the dentine.

FIG. 4. The same seen from above. (Magnified 350 times.)
a. Anterior excavation of the tooth.
b. Ramifying canals of the cement. c. Simple canals.
d. Pulp of the tooth. e. Margin of the bowl-like swelling in the middle.
f. Intermaxillary bone, with its bone-cells.

FIG. 5. The tooth alone, in profile. (Magnified.)

FIG. 6. Tissue of the eggshell, showing the crossing fibres, a and b. (Magnified 350 times.)

FIG. 7. a. b. c. d. e. f., several stages of the fibre-bulbs, taken from the fresh egg shell of Tropidonotus natrix, Kuhl.

ON THE ARMATURE OF THE LOWER BILL OF THE HATCHING TRINGA PUSILLA, WILSON.

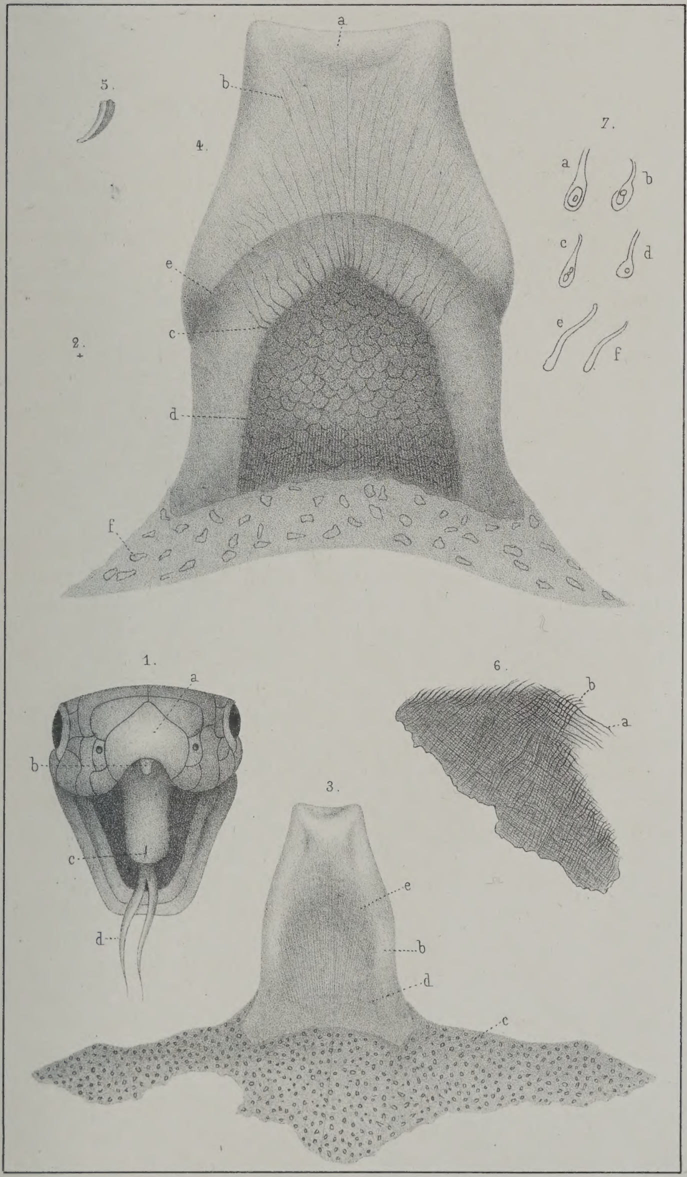
BY DR. DAVID F. WEINLAND.

On the 6th of July last, I caught at Nahant a young of the common Peep (*Tringa pusilla*, Wils.) of our seashore. This bird could have been hatched from the egg hardly more than one or two days, for it still wore the hard, horny tubercle on the upper bill, which we find in all birds when hatching, and which serves to knock open the eggshell. But I was surprised to find a similar armature on the lower bill, though less prominent, which, as far as I know, never has been observed before. Now the upper horn, as we may call it, reaching a good deal beyond the lower, this latter one cannot work as a knocking hammer, as the upper does; therefore I suppose that the horn on the lower bill serves only as a support for the upper bill while knocking; this is the more likely, as the bill of this kind of birds is at that time rather long, slender and weak.

I am persuaded that this armature of the lower bill occurs in all Tringæ; it may even occur in all Waders when hatching.

In reference to the structure of this organ in the upper and lower bill, I will add, that it is not a mere excrescence of the sheath of the bill, but formed separately and only attached to it. On the contrary in turtles, where we find the same organ, it is a mere excrescence of the sheath of the bill, and while in birds it drops at once, soon after hatching, in turtles it is gradually worn off. In both, however, birds and turtles, it consists of the same flat epidermidal cells which compose also the horny sheath of the bill.

CAMBRIDGE, Dec. 1856.



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